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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/594,549

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EXAMINER

CARRILLO, BIBI SHARIDAN

ART UNIT

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1792

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/594,549	Applicant(s) OHNO ET AL.	
	Examiner Sharidan Carrillo	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 18-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 21-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-24 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>09/27/06, 6/20/08</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 22 and 24 are objected to because of the following informalities: Claims 22 and 24 are objected to because the claims are duplicative. While the claims do not recite the identical claim language, they are identical in scope. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is indefinite because it is unclear what the skilled artisan would consider as an "adequate distance" apart from the center of the target substrate. Claim 1 is indefinite because it is unclear what the skilled artisan would consider as "a vicinity of the center" of the substrate. Claims 1 and 21 indefinite because the claims recite "while moving a rinse-liquid feed point for supply of the rinse liquid to the target substrate". The phrase is indefinite because it is unclear how the rinse liquid can be moved to the target substrate if the claim previously recites feeding the rinse liquid at the center of the target substrate. Claims 2, 21, 23, are indefinite because of the terms "adequate distance", "in the vicinity of the center" as described above. Claims 3 and 11 are indefinite because it

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is unclear whether the circumferential portion of the substrate is the same as the periphery, as recited in claim 1. Claims 7 and 15 are indefinite because it is unclear what the skilled artisan would consider as "near the circumferential portion of the target substrate". Claims 8 and 16 indefinite because it is unclear what applicant is trying to claim. Specifically, it is unclear what is meant by the gas feed point shifted from a direction in which the rinse-liquid feed point moves from the center to the periphery. How is the gas feed point shifted? Does shifted refer to the distance between the two feed points or the direction of the gas feed point? Is the gas feed point moving in an opposing direction from the rinse-liquid feed point? It is unclear what applicant is trying to claim. Claims 10 and 22 are indefinite because it is unclear whether the "feed point" refers to a rinse liquid feed point. The term "the rinse-liquid feed point" lacks positive antecedent basis.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-2, 5-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Shunichi (JP2002-057088).

Re claim 1, Shunichi teaches a method of cleaning a wafer. Re claim 1, Shunichi teaches rotating the wafer horizontally, start feeding a rinse liquid to the center of the

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wafer, and start feeding the inactive gas (nitrogen) at an adequate distance apart from the center of substrate. Paragraph 41 of the machine translation teaches that the air blowing device 62 is located only a prescribed distance from the rinse feed nozzle 63. Shunichi teaches moving both the blowing device 62 and the rinse feed nozzle 63 from the center to the peripheral edge of the wafer (paragraph 47 for example). Re claim 1, the limitations of moving a gas feed point from the center to an area located radially inward from the rinse feed point are inherently met based on the positions of the nozzles as illustrated in Fig. 4. Clearly as the nozzles move from the center to the periphery, the gas feed point 62 is located radially inward from the rinse feed point 63. Additionally, it is well known in the art, as evidenced by Yamasaka (5997653) to stop the gas blowing nozzle at a point somewhat inward of the outermost periphery of the wafer to prevent the blown gas from being spread outside of the wafer. Re claim 2, refer to paragraph 2 of the machine translation. Re claim 5, refer to paragraph 47 which teaches returning the rinse arm to the home position prior to injecting the N₂ gas on the substrate surface. Re claim 6, the limitations are inherently met since Shunichi is performing the same method steps of applying a rinse liquid to the substrate surface, and therefore, inherently a liquid film is formed. Re claim 7, in view of the indefiniteness, as described above, the limitations are met by the prior art of Shunichi (see Fig. 4 for example). As previously stated, it is well known in the art, as evidenced by Yamasaka (5997653) to stop the gas blowing nozzle at a point somewhat inward of the outermost periphery of the wafer to prevent the blown gas from being spread outside of the wafer. Re claim 8, in view of the indefiniteness, the limitations are met by the prior art.

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Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shunichi (JP2002-057088), as evidenced by Nagakawa (US203/0022515).

Shunichi fails to teach increasing the moving speed of the gas at a faster rate at the circumferential portion of the substrate than at the center portion of the substrate. It would have been obvious to increasing the moving rate at the circumferential portion than at the center of the substrate for the following reasons. During rotation of the wafer, the wafer dries at a slower rate in the center than at the edge of the wafer, as a result of centrifugal force. Therefore, less time is needed for drying the wafer at the periphery than at the center of the wafer. Consequently, since the wafer dries at a slower rate in the center as compared to the periphery, the moving rate at which the gas is applied to the wafer should increase as the nozzle translates from the center to the edge. Additionally, it is well known in the art, that the rotational speed of the wafer at the outer peripheral is faster than at the central portion of the wafer, as evidenced by Nakagawa (US2003/0022515, paragraph 29), therefore it requires less time to dry the outer peripheral region than the center portion of the wafer. It would have been obvious and well within the level of the skilled artisan, to modify the method of Shunichi to include moving the gas nozzle at a faster rate to the periphery than at the center, since the periphery requires less drying time as a result of the increased rotational speed of the wafer.

10. Claims 4, 9-10, 12-17, 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shunichi (JP2002-057088) and further in view of Yamasaka (5997653).

Re claims 4, 10, 12, 22 and 24, Shunichi teaches the invention substantially as claimed with the exception of increasing the number of rotations during application of

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the gas as compared to the rinse liquid. Yamasaka teaches a method for washing and drying substrates. Specifically, Yamasaka teaches washing with a rinse liquid, followed by drying with a gas. In the embodiment of Fig. 9 and col. 7-col.8 bridging, Yamasaka teaches increasing the rate of rotation while applying the drying gas, for purposes of reducing the time period in which drying occurs.

Re claims 9 and 17, Shunichi fails to teach a substrate being hydrophobic. However, in the absence of a showing of unexpected results and criticality, the skilled artisan would reasonably expect the substrate of Shunichi to have hydrophobic properties since Shunichi is cleaning and drying the same type of substrate (i.e. wafer) as the instant invention. Furthermore, it is well known in the art, that wafers include hydrophobic films, as evidenced by Yamasaka (col. 1, lines 60+), therefore, the skilled artisan would reasonably expect the wafer of Shunichi to also include a hydrophobic surface. Re claim 13, refer to paragraph 47 which teaches returning the rinse arm to the home position prior to injecting the N₂ gas on the substrate surface. Furthermore, it would have been well within the level of the skilled artisan to discontinue and/or reduce the rinsing liquid, in order to reduce the amount of liquid present on the wafer surface prior to the drying step. Re claim 14, refer to the teachings of Yamasaka for example (Fig. 10B). Furthermore, the skilled artisan would reasonably expect a liquid film to be formed on the substrate of Shunichi since Shunichi performing the same method steps as the instantly claimed invention. Re claim 15, in view of the indefiniteness, as described above, the limitations are met by the prior art of Shunichi (see Fig. 4 for example). Additionally, Yamasaka teaches stopping the gas blowing nozzle at a point

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somewhat inward of the outermost periphery of the wafer to prevent the blown gas from being spread outside of the wafer. Re claim 16, in view of the indefiniteness, the limitations are met by the prior art.

Re claims 21-24, Shunichi teaches a drive control section 95. It is unclear whether Shunichi teaches a computer for performing the claimed method steps. Yamasaka teaches a controller 40 (Fig. 5, Fig. 8, S1, col. 6, lines 45+) for performing the claimed method steps. Furthermore, it is notoriously well known in the art, as further evidenced by Nakamura et al. (US2006/0048792), to use a controller to perform various processes during the cleaning and drying of a semiconductor wafer. Since it is conventional in the art to use a controller, as evidenced by Yamasaka, it would have been well within the level of the skilled artisan to have modified the method of Shunichi, to include a controller, to control various processing steps during the treatment of a semiconductor wafer. Re claim 23, and the limitations of moving the gas feed point in an area located radially inward of the rinse liquid feed point, refer to the teachings of Yamasaka, as previously discussed.

11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shunichi (JP2002-057088) and further in view of Yamasaka (5997653), as applied to claims 4, 9-10, 12-17, 21-24, as described in paragraph 10 above, and further evidenced by Nagakawa (US203/0022515).

Shunichi, as modified by Yamasaka, fail to teach increasing the moving speed of the gas at a faster rate at the circumferential portion of the substrate than at the center portion of the substrate. It would have been obvious to the skilled artisan to increase

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the moving rate at the circumferential portion than at the center of the substrate for the following reasons. During rotation of the wafer, the wafer dries at a slower rate in the center than at the edge of the wafer, as a result of centrifugal force. Therefore, less time is needed for drying the wafer at the periphery than at the center of the wafer.

Consequently, since the wafer dries at a slower rate in the center as compared to the periphery, the moving rate at which the gas is applied to the wafer should increase as the nozzle translates from the center to the edge. Additionally, it is well known in the art, that the rotational speed of the wafer at the outer periphery is faster than at the central portion of the wafer, as evidenced by Nakagawa (US2003/0022515, paragraph 29), therefore it requires less time to dry the outer peripheral region than the center portion of the wafer. It would have been obvious and well within the level of the skilled artisan, to modify the modified method of Shunichi, to include moving the gas nozzle at a faster rate to the periphery than at the center, since the periphery requires less drying time as a result of the increased rotational speed of the wafer.

12. Applicant's election of Group I, claims 1-17 and 21-24 in the reply filed on 11/13/09 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ueno teaches a spin cleaning method. Mertens teaches a method of removing a liquid from a surface. Ravkin teaches drying a surface with a surface tension agent. Thakur et al. teach cleaning a wafer. Hirose et al. teach a

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substrate processing method. Aoki et al. teach cleaning with IPA and nitrogen. Izumi and Kim et al. teach drying with a gas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharidan Carrillo whose telephone number is 571-272-1297. The examiner can normally be reached on M-W, F 6:30-5:00pm, alternating Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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bsc